

Basis of Design

This section applies to reinforced concrete utility tunnels and trenches.

Background

- Utility Tunnel is a utilidor for mechanical and electrical services, installed by drilling and/or tunneling. The tunnel has an arched top.
- Utility Trench is a utilidor for mechanical and electrical services installed by open cut excavation with both inside and outside of the walls formed or prefabricated. The trench has a flat top.
- The University of Washington main campus distributes mechanical and electrical utilities in tunnels. See University drawings 802-RU-01, 803RU-01, 803RU-04, 803-RU-06, 804RU-01, and 807RU-01 for tunnel mechanical utilities. For information regarding tunnel electrical utilities, contact Campus Engineering. For information regarding tunnel communication utilities, contact UW Technology.
- Refer to University drawings 875RU-1 through 875RU-18 for utilities not routed through campus utility tunnels. The above drawings are updated regularly, but are schematic and may not be accurate or complete.

Design Criteria

- Install the following utilities in reinforced concrete utility tunnels, or utility trenches; steam, condensate, compressed air, central cooling water, power, and communications.
- Do not install water, gas, sewer, or storm drain piping in utility tunnels or utility trenches.
- Locate tunnels and manholes based on existing and planned facilities. Do not locate manholes in roadways. Do not locate manholes in walkways unless approved by Campus Engineering. Tunnel manhole covers, if placed in paved areas, shall meet AASHTO H20 loading criteria.
- Design utility tunnels and trenches in accordance with ACI standards and as shown in the tunnel and trench sections.
- Provide embedded inserts and plates for piping and cable tray supports.
- Slope floors towards the piping side of the tunnel to minimize water on walking surfaces.
- Maintain uniform tunnel slope between manholes.
- Provide a tunnel drain as shown on tunnel and trench sections.
- Provide permanent tunnel lighting at manholes and as shown on the Tunnel and Trench Sections.
- Ensure adequate natural ventilation.
- Provide for drainage of storm water entering the top manhole grating and offset the manhole opening to prevent rain water from entering the tunnel.
- Provide steel grated ventilation openings with security locks bolted from below.
- Below the top manhole section, provide steel grated landings connected by stairs and pipe railing, or 60 degree ships ladders.

- At the top manhole section to grade, install galvanized, safety type, ladders for tunnel access through the top grating. Provide ladder extension to provide safe access/egress.
- Install tunnel manholes with the riser offset from the tunnel main as shown on Utility Tunnel Manhole Plan.
- Provide a permanent waterproof access opening for convenient installation and removal of tunnel equipment and 20 foot lengths of pipe.
- Secure tunnel portals to buildings with six-inch concrete masonry block walls and 2'X6'X1-3/4" hollow metal doors fitted with pin tumbler locks (lock cylinder furnished by the University).

Design Evaluation

The following information is required to evaluate the design:

- Programming Phase: Statement of design intent, tunnel route, and a list of utilities to be connected to campus systems.
- Schematic Phase: Drawings showing existing tunnels and utilities, a narrative material and system description, and a new tunnel preliminary alignment plan and profile.
- Design Development Phase: Demolition plans, plans showing new and existing utilities, utility and tunnel details, an outline specification, and developed tunnel plans and profiles.
- Construction Document Phase: Complete plans and specifications.
 - 1) Provide general tunnel plans, sections, and details. Include pipe and cable tray supports, trench and bedding details, connection and joint details, manhole details, building connection details, tunnel profile with utility elevations, tunnel invert elevations at manholes and building connections, tunnel drains, and final tunnel plans and profiles.
 - 2) Include plans showing existing underground tunnels and utilities (power, communications, gas, water, storm drain, sanitary sewer, and street lighting).

Construction Submittals

- Provide standard industry submittal requirements.

Related Sections

- Facilities Services Design Guide - Earthwork

Products, Materials and Equipment

Cast-In-Place Concrete:

- Portland cement: Conform to requirements of ASTM C-150.
- Sand: Conform to the requirements of ASTM C33.
- Reinforcing steel: Conform to the requirements of ASTM A615, Grade 60.

- Apply waterproofing at joints

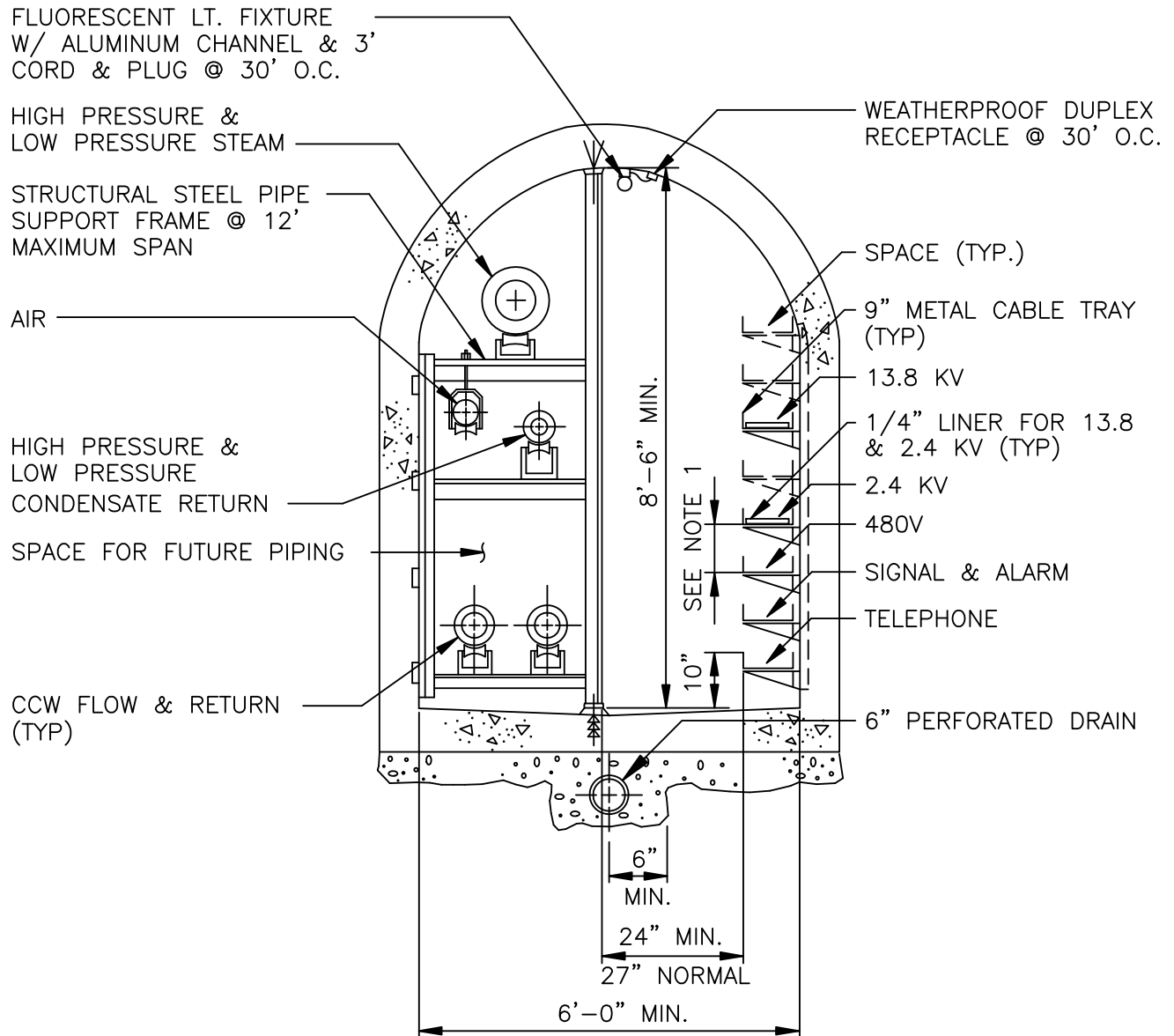
Prefabricated Concrete:

- Prefabricated concrete for tunnels shall be steel reinforced and in conformance with ACI standards.

Installation, Fabrication and Construction

- Prefabricated concrete: Install gaskets at joints of prefabricated concrete sections and apply grout and waterproofing to interior and exterior joints.
- Install in accordance with ACI standards.
- Cure cast-in-place concrete for a period of 7 days. If the formwork is removed before the 7-day curing period, the concrete must be thoroughly wetted and a moisture retaining cover provided. Place the cover in the widest practical width with side and ends lapped at least 3 inches and sealed by waterproof tape or adhesive.
- Install water stops at concrete joints.
- Install damp-proofing to exterior walls, roof surfaces of tunnels, trenches, and manholes.
- Refer to the following University drawings:
 - 1) Utility Tunnel Section
 - 2) Utility Trench Section
 - 3) Utility Tunnel Manhole Section
 - 4) Utility Tunnel Electrical Tray Bracket Detail
 - 5) Utility Tunnel Mechanical Pipe Supports Detail 1
 - 6) Utility Tunnel Mechanical Pipe Supports Detail 2

END OF DESIGN GUIDE SECTION

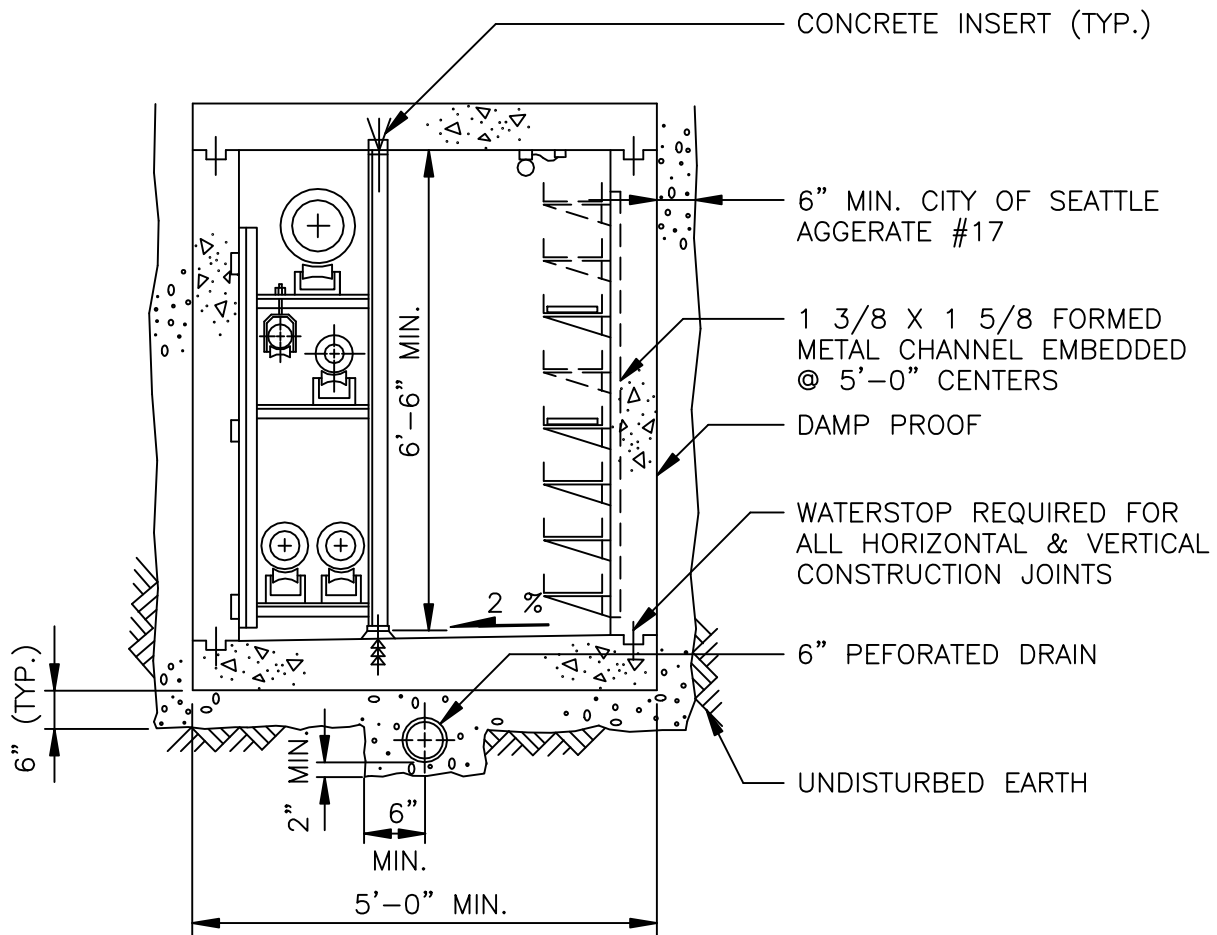


NOTES :

1. TRAY SPACING 9" TYPICAL EXCEPT AS DIRECTED BY THE UNIVERSITY

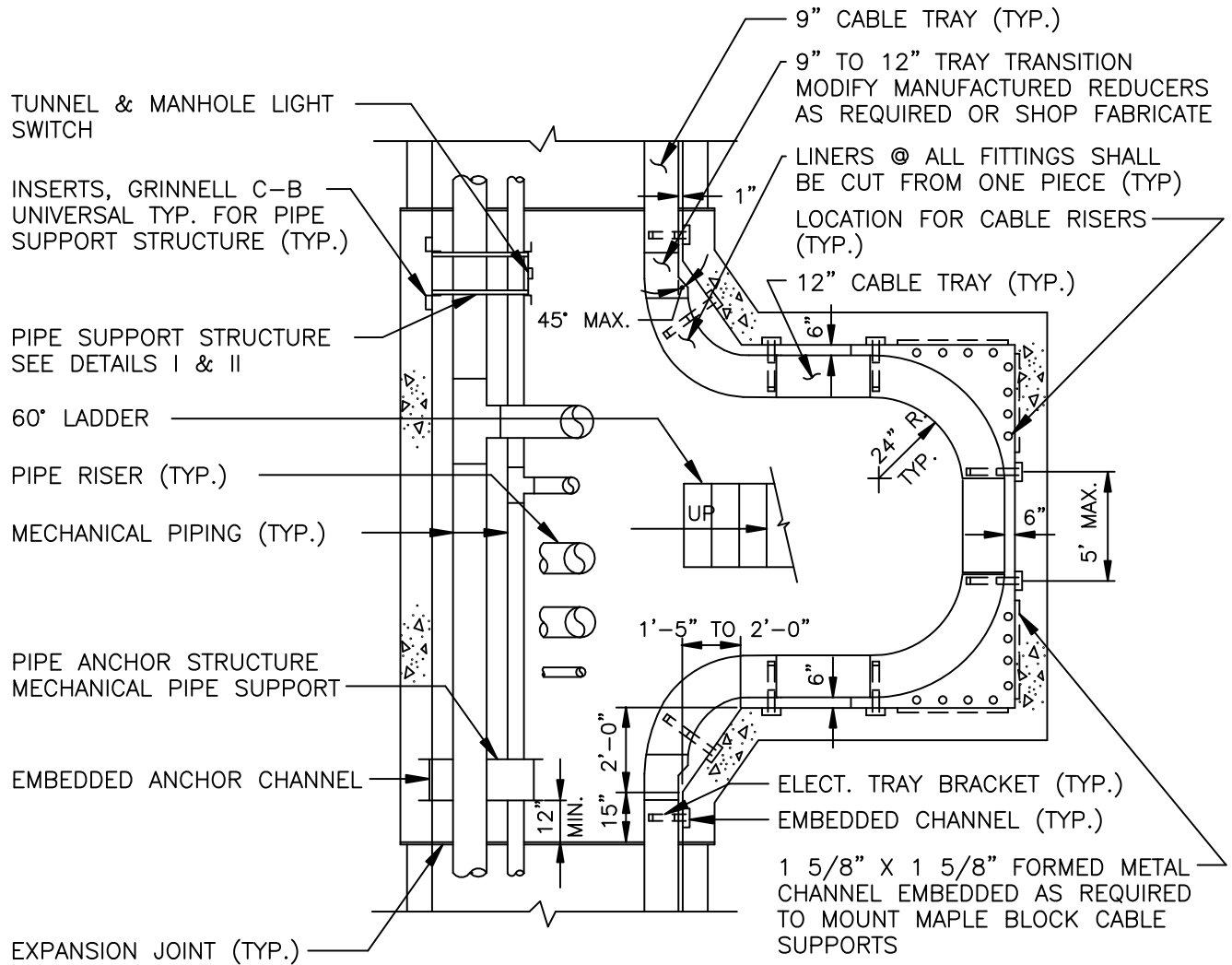
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Utility Tunnel Section



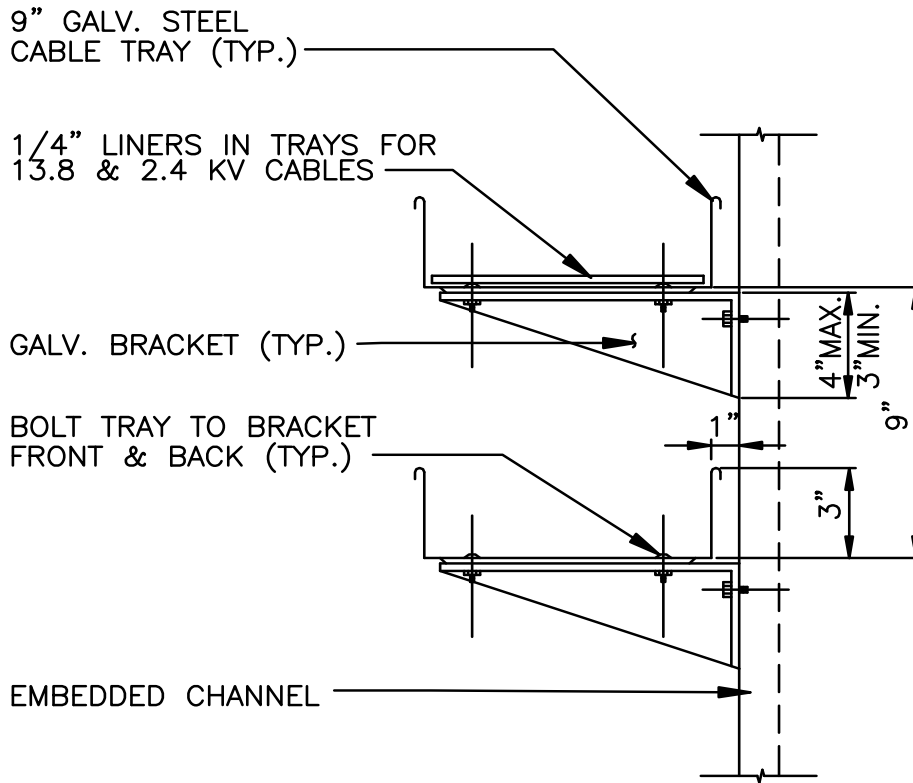
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Utility Trench Section



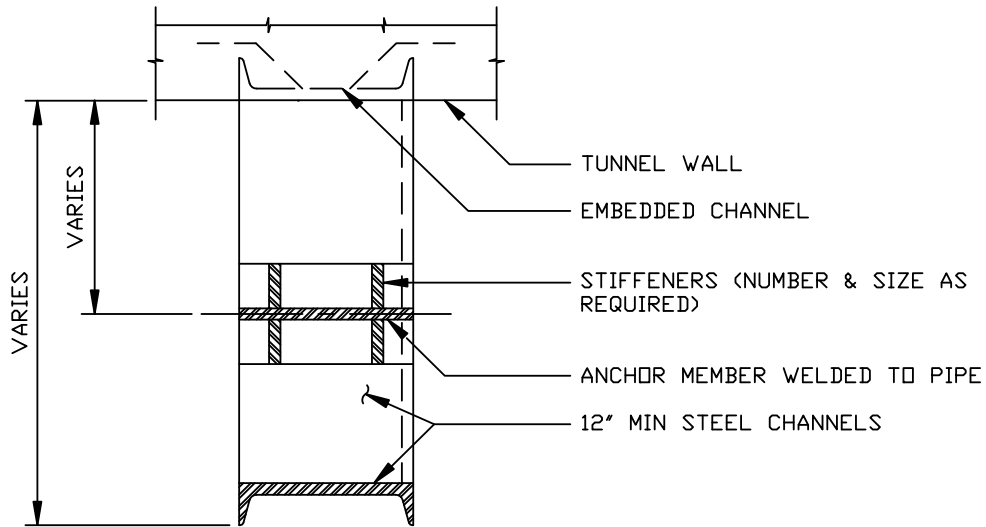
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Utility Tunnel Manhole Plan

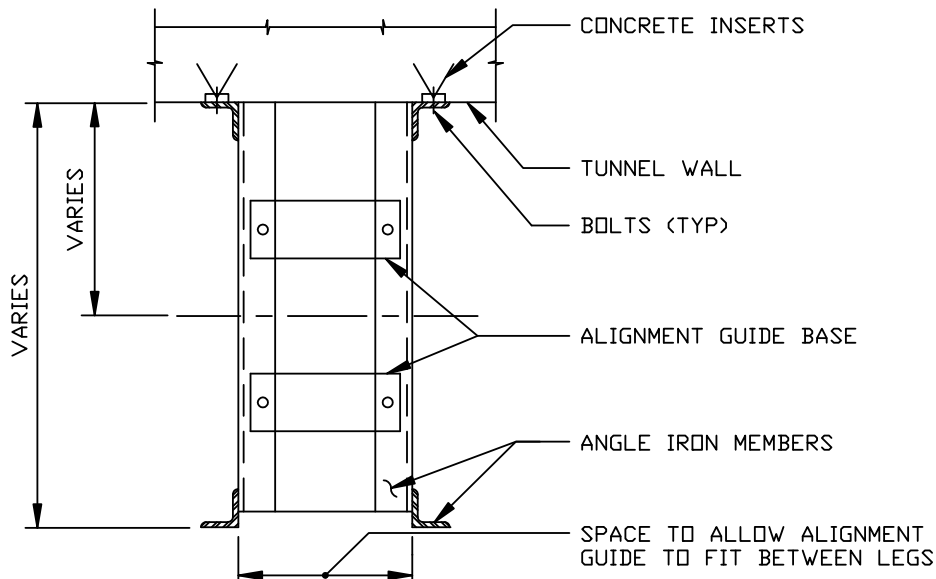


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Utility Tunnel Electrical Tray Bracket Detail



PIPE ANCHOR PLAN



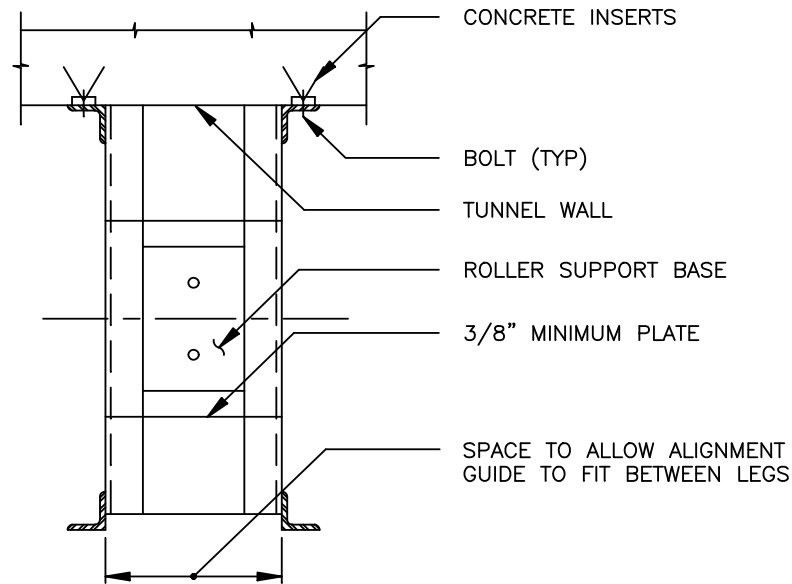
ALIGNMENT GUIDE PLAN

NOTES :

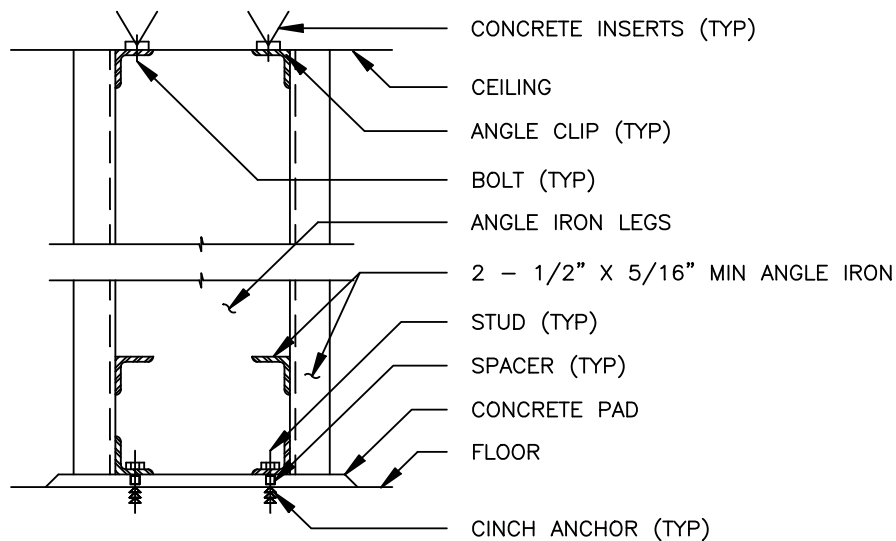
1. STRUCTURAL MEMBER SIZES & FASTENERS WILL VARY. SIZE ALL COMPONENTS FOR THE MAX POSSIBLE LOADS & FORCES TAKING IN ACCOUNT FUTURE PIPING.
2. WELD ALL JOINTS. FULL LENGTH WELDS (NO TACK WELD).
3. WITH TWO PIPES ON ONE SUPPORT MEMBER, SHIM AS REQUIRED WITH STEEL PLATES UNDER ONE ONLY.
4. PAINT ALL STEEL AFTER FABRICATION.

SD-M-24

Utility Tunnel Mechanical Pipe Supports Detail 1



ROLLER SUPPORT PLAN



ELEVATION

NOTES :

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3. WITH TWO PIPES ON ONE SUPPORT MEMBER, SHIM AS REQUIRED WITH STEEL PLATES UNDER ONE ONLY.
4. PAINT ALL STEEL AFTER FABRICATION.

SD-M-25

Utility Tunnel Mechanical Pipe Supports Detail 2